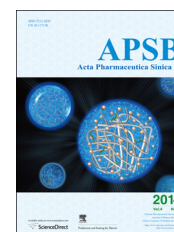




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### Editor Profile

Editor profile: Guest editor of special issue "Drug Delivery System and Pharmaceutical Technology"

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### Editorial

Editorial by Chuanbin Wu

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### Cover story

Dajun D. Sun and Ping I. Lee

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## Review Articles

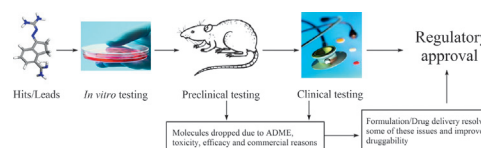
### Can formulation and drug delivery reduce attrition during drug discovery and development—review of feasibility, benefits and challenges

Basavaraj S, Guru V. Betageri

Western Centre for Drug Development, Western University of Health Sciences, Pomona, CA 91766, USA

This paper provides insight into effective application of formulation strategies to reduce attrition of molecules during drug discovery/development. Comprehensive information on utilizing solubilization, prodrug, proliposomes, polymer conjugation, targeted/timed release formulations, alternate routes of delivery to reduce attrition of molecules due to ADME, efficacy and toxicity issues is provided. Clinical success and challenges are documented.

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### Fundamental aspects of solid dispersion technology for poorly soluble drugs

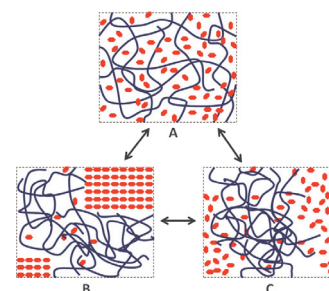
Yanbin Huang<sup>a</sup>, Wei-Guo Dai<sup>b</sup>

<sup>a</sup>Key Laboratory of Advanced Materials (MOE), Department of Chemical Engineering, Tsinghua University, Beijing 100084, China

<sup>b</sup>Janssen Research and Development, Johnson&Johnson Company, Randor 19087, PA, USA

A solid dispersion is basically a drug–polymer two-component system in which the mechanism of drug dispersion is the key to understanding its behavior. In this review, we summarize our current understanding of solid dispersions both in the solid state and in dissolution emphasizing the fundamental aspects of this important technology.

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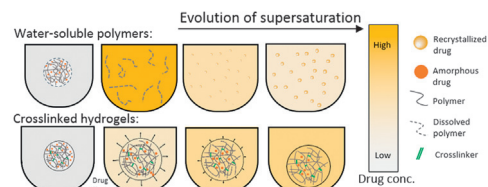
## Crosslinked hydrogels—a promising class of insoluble solid molecular dispersion carriers for enhancing the delivery of poorly soluble drugs

Dajun D. Sun, Ping I. Lee

Department of Pharmaceutical Sciences, Leslie Dan Faculty of Pharmacy,  
University of Toronto, Toronto M5S 3M2, Ontario, Canada

ASD based on water-soluble polymers produces high supersaturation upon dissolution of the polymer carrier, which results in rapid drug recrystallization. ASD in hydrogels avoids a sudden surge of supersaturation in the dissolution medium through a feedback-controlled diffusion mechanism, which achieves more sustained supersaturation than that based on water-soluble polymers.

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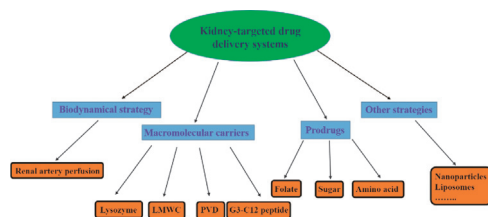
## Kidney-targeted drug delivery systems

Peng Zhou, Xun Sun, Zhirong Zhang

Key Laboratory of Drug Targeting and Drug Delivery Systems, Ministry of Education, West China School of Pharmacy, Sichuan University, Chengdu 610041, China

In this review, the strategies that have been employed to develop kidney-targeted drug delivery systems were summarized and how macromolecular carriers and prodrugs play crucial roles in targeting drugs to particular target cells in the kidney was described.

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## Original Articles

### Evaluation of percutaneous permeation of repellent DEET and sunscreen oxybenzone from emulsion-based formulations in artificial membrane and human skin

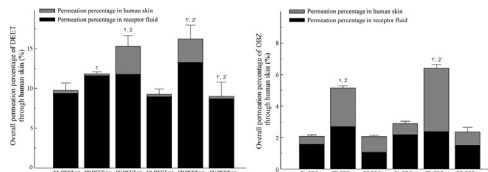
Tao Wang<sup>a</sup>, Donald Miller<sup>b</sup>, Frank Burczynski<sup>a</sup>, Xiaochen Gu<sup>a</sup>

<sup>a</sup>Faculty of Pharmacy, University of Manitoba, Winnipeg, Manitoba R3E 0T5, Canada

<sup>b</sup>Department of Pharmacology and Therapeutics, University of Manitoba, Winnipeg, Manitoba R3E 0T5, Canada

The effects of emulsion-type, thickening agent, and droplet size on transmembrane permeation of repellent DEET and sunscreen oxybenzone were studied using *in vitro* diffusion experimentation.

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### Three-dimensional DEM-CFD analysis of air-flow-induced detachment of API particles from carrier particles in dry powder inhalers

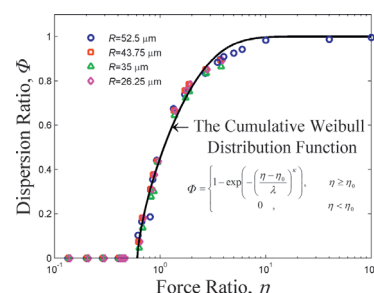
Jiecheng Yang<sup>a,b</sup>, Chuan-Yu Wu<sup>b</sup>, Michael Adams<sup>a</sup>

<sup>a</sup>School of Chemical Engineering, University of Birmingham, Birmingham B15 2TT, UK

<sup>b</sup>Department of Chemical and Process Engineering, University of Surrey, Guildford GU2 7XH, UK

In this study, a coupled DEM-CFD (discrete element method-computational fluid dynamics) is employed to investigate the influence of air flow on the dispersion performance of the carrier-based DPI formulations.

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### Bio-mimetic drug delivery systems designed to help the senior population reconstruct melatonin plasma profiles similar to those of the healthy younger population

Ying Li<sup>a,b</sup>, Liuyi Wang<sup>c</sup>, Li Wu<sup>b,d</sup>, Xueju Zhang<sup>b</sup>, Xue Li<sup>b</sup>, Zhen Guo<sup>b</sup>, Haiyan Li<sup>b</sup>, Peter York<sup>b</sup>, Shuangying Gui<sup>a</sup>, Jiwen Zhang<sup>a,b,d</sup>

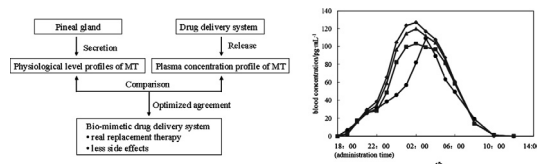
<sup>a</sup>Anhui University of Chinese Medicine, Hefei 230038, China

<sup>b</sup>Center for Drug Delivery Systems, Shanghai Institute of Materia Medica, Chinese Academy of Sciences, Shanghai 201203, China

<sup>c</sup>Hainan Weikang Pharmaceutical (Qianshan) Co., Ltd, Anqing 246000, China

<sup>d</sup>College of Life Sciences, Jilin University, Changchun 130012, China

A bio-mimetic drug delivery system learns after the nature to mimic the physiological circadian rhythm of endogenous substance *via* optimizing exogenous substance release profile to give a pharmacokinetically real replacement therapy with reduced side effects.

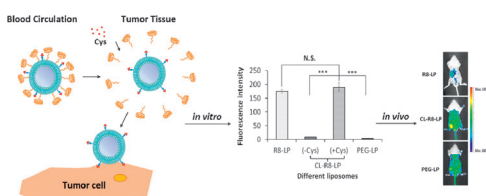


### A detachable coating of cholesterol-anchored PEG improves tumor targeting of cell-penetrating peptide-modified liposomes

Jie Tang, Li Zhang, Han Fu, Qifang Kuang, Huile Gao, Zhirong Zhang, Qin He

Key Laboratory of Drug Targeting and Drug Delivery Systems, Ministry of Education, West China School of Pharmacy, Sichuan University, Chengdu 610041, China

A cholesterol anchored reduction-sensitive PEG was applied here to help R8 modified liposomes achieve tumor targeted delivery *in vivo*. The combination of reduction-sensitive PEG and CPPs could overcome *in vivo* "kinetic barriers" and the cytoplasmic membrane barrier under the control of Cys. This new liposome formulation improves the non-specificity of CPPs and enhances the tumor targeted drug delivery of CPP-modified carriers.



### Comparative pharmacokinetics of tetramethylpyrazine phosphate in rat plasma and extracellular fluid of brain after intranasal, intragastric and intravenous administration

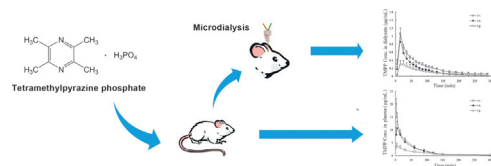
Dongmei Meng<sup>a,b</sup>, Haoyang Lu<sup>a</sup>, Shanshan Huang<sup>b</sup>, Minyan Wei<sup>a</sup>, Pingtian Ding<sup>c</sup>, Xianglin Xiao<sup>b</sup>, Yuehong Xu<sup>a</sup>, Chuanbin Wu<sup>a</sup>

<sup>a</sup>School of Pharmaceutical Sciences, Sun Yat-sen University, Guangzhou 510006, China

<sup>b</sup>The First Affiliated Hospital of Guangzhou Medical College, Guangzhou 510120, China

<sup>c</sup>School of Pharmacy, Shenyang Pharmaceutical University, Shenyang, 110016, China

Pharmacokinetic analysis of tetramethylpyrazine phosphate (TMPP) in plasma and extracellular fluid in cerebral cortex of rats after intranasal, intragastric and intravenous administration was carried out with microdialysis sampling and HPLC-UV analysis. The results indicated that TMPP was rapidly absorbed from the nasal mucosa into the systemic circulation and then across the blood-brain barrier to reach the cerebral cortex. Intranasal administration of TMPP may be a promising alternative to intravenous and oral approaches.



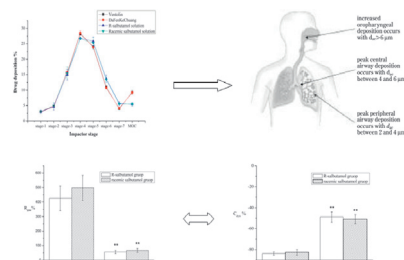
### An aerosol formulation of R-salbutamol sulfate for pulmonary inhalation

Xuemei Zhang<sup>a</sup>, Qing Liu<sup>a</sup>, Junhua Hu<sup>a</sup>, Ling Xu<sup>b</sup>, Wen Tan<sup>a</sup>

<sup>a</sup>School of Bioscience and Bioengineering, South China University of Technology, Guangzhou 510006, China

<sup>b</sup>Key-Pharma Biomedical Inc., Dongguan 523000, China

Drug particles will deposit in different stages of NGI which simulate the lower respiratory tract structure approximately. Also alleviation of airway hyperreactivity by inhaling R-salbutamol sulfate solution was validated both in airway resistance and dynamic compliance of lung in comparison of racemic salbutamol.



### Preparation and evaluation of sustained-release solid dispersions co-loading gastrodin with borneol as an oral brain-targeting enhancer

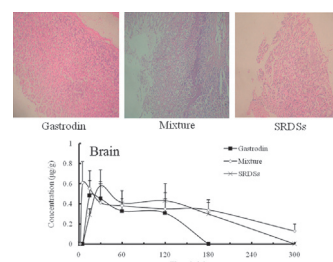
Zheng Cai<sup>a</sup>, Xiaolu Lei<sup>a</sup>, Zhufen Lin<sup>a</sup>, Jie Zhao<sup>a</sup>, Feizhen Wu<sup>a</sup>, Zhaoxiang Yang<sup>b</sup>, Junxue Pu<sup>b</sup>, Zhongqiu Liu<sup>a,c</sup>

<sup>a</sup>School of Pharmaceutical Sciences, Southern Medical University, Guangzhou 510515, China

<sup>b</sup>Institute of Pharmaceutical Research, Kunming Pharmaceutical Co., Kunming 650100, China

<sup>c</sup>International Institute for Translational Chinese Medicine, Guangzhou University of Chinese Medicine, Guangzhou 510006, China

Although the brain targeting of the sustained-release solid dispersions was slightly weaker (brain targeting index: 1.83 vs. 2.09) compared with the free mixture of gastrodin and borneol, stomach irritation caused by borneol obviously reduced. Sustained-release technology can be used to reduce stomach irritation by borneol while preserving sufficient transport capacity for oral brain-targeting drug delivery.

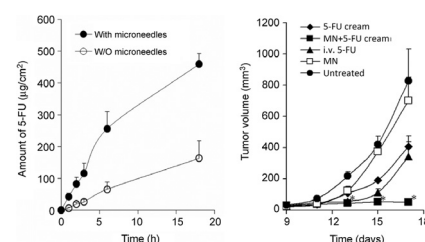


### The effect of microneedles on the skin permeability and antitumor activity of topical 5-fluorouracil

Youssef W. Naguib, Amit Kumar, Zhengrong Cui

The University of Texas at Austin, College of Pharmacy, Pharmaceutics Division, Austin, TX 78712, USA

Pretreatment of mouse skin with microneedles significantly increased the skin permeability of 5-fluorouracil (5-FU) *in vitro* (left), and enhanced the antitumor activity of topically applied 5-FU against B16-F10 mouse melanoma cells implanted subcutaneously in mice (right).



## Short Communication

### Enhanced delivery of hydrophilic peptides *in vitro* by transdermal microneedle pretreatment

Suohui Zhang, Yuqin Qiu, Yunhua Gao

Lab of Organic Optoelectronic Functional Materials and Molecular Engineering, Technical Institute of Physics and Chemistry, Chinese Academy of Sciences, Beijing 100190, China

Solid microneedle significantly enhanced the delivery of peptides with low molecular weight through skin and provided a sustained release of the peptides during 24 h. Permeation rate of peptides decreased with the molecular weight increased.

